

ART. XIII.—*New or Little-Known Victorian Fossils in the National Museum.*

PART XIII.—SOME SILURIAN SPECIES OF THE GENUS *LINGULA* ;
WITH NOTES ON ITS SHELL-STRUCTURE AND A PARASITIC
PLANT.

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(With Plates XLV.).

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Introductory Remarks.

Two species of the genus *Lingula* have been described from the silurian rocks of Victoria—viz., *Lingula spryi*, Chapman, and *L. yarraensis*, Chapm. (olim *L. latior*, Chapman non McCoy).¹ The present paper deals with four more species and varieties—*L. lewisii*, J. de C. Sowerby, var. *flemingtonensis*, var. nov. ; *L. cf. striata*, J. de C. Sowerby ; *L. aff. symondsi*, Davidson ; and *L. perovata*, J. Hall.

Both divisions of the silurian in Victoria have afforded specimens of *Lingula*, but the genus is far more abundant in the lower, or melbournian, stage ; only one species, *L. perovata*, occurring in the yeringian. The melbournian species agree to some extent with already known forms, ranging from the Upper Llandovery to the Upper Ludlows in Great Britain. The yeringian species now recorded occurs in the Niagara series (Wenlockian) of North America. *L. symondsi*, to which our passage-bed species seems related, has a fairly wide range in Great Britain, from the Upper Llandovery to the Lower Ludlow. The genus, as might be expected from the generally wide geological range of the different species in silurian strata, does not

¹ *L. spryi*, Chapm., Proc. Roy. Soc. Victoria, vol. xvi., Pt. 1, n.s. (1903), p. 64, pl. x. figs. 9, 9a. *L. latior*, Chapm., op. cit., p. 65, pl. x., figs. 10, 10a ; nom. mut. *L. yarraensis*, Chapm., op. cit., vol. xviii., Pt. 1, n.s. (1905), p. 19.

furnish any definite data as to zonal distribution, so far as can be gathered by comparison with the two widely separated areas of Europe and Australia. As a rule the shells of palaeozoic fossils in the Melbourne district are only indifferently preserved, but a marked exception is shown in *Lingula lewisii*, var. *flemingtonensis*, described below. In that varietal form something akin to the original colour still remains in the shell, accompanied by the dual structure of corneous and former calcitic layers, the corneous showing undoubted tubulated structure, in confirmation of Carpenter's researches.

***Lingula lewisii*, J. de C. Sowerby, var. *flemingtonensis*,
var. nov. (Pl. XLV., Figs. 1-5).**

Description.—This variety is comparable in almost every way with the type species, the distinguishing characters consisting in the slightly broader aspect of the shell and its very distinct, radiate striae.

L. lewisii is described by J. de C. Sowerby¹ as "Oblong, compressed, smooth; sides straight and parallel." Davidson, in his "Monograph of British Silurian Brachiopoda,"² describes it as with "surface nearly smooth, or marked with numerous concentric raised lines or ridges of growth, and here and there by more deeply indented striae." The figures given by both authors show faint radial or vertical striae. I have examined the shell-surface of two examples of *L. lewisii* in the National Museum collection, from Walsall and Sedgely in Staffordshire, and note that the striae thereon are distinct, fine, and generally interrupted by the concentric growth-lines; whereas in the Victorian shells the striae are strong, continuous, and often deeply incised. In point of size the Victorian variety does not quite equal the European species, but is nevertheless by far the largest of the *Lingulae* in our silurian strata.

The largest Victorian specimen measures 23 mm. by about 16 mm., which is 7 mm. shorter than the English examples recorded by Davidson. The type species ranges practically

1 In Murchison's Silurian System (1839), Pt. II., p. 615, pl. vi., fig. 9.

2 Pal. Soc., 1866, p. 35, pl. iii., figs. 1-6.

throughout the silurian (? Upper Llandovery to Upper Ludlow) in Great Britain, where it has a wider range than any other species of the genus.

Occurrence.—Silurian (melbournian). Flemington (“Royal Park”). Coll. by the Geol. Survey of Victoria.

Note on the Shell-Structure of the Above Variety.

It is remarkable that an ancient brachiopod shell such as this should retain so much of its original structure; especially since it occurs in so unpromising a matrix. In appearance the shells, of which there are at least nine examples in the museum collection, resemble those of the recent corneous *Lingulae*, but are darker in colour. They vary from dark brown to almost purple black, and the colouring matter, which appears to be original, is organic, that is to say, carbonaceous. The surface of the shell has a dull sheen, resembling that of polished cow-horn, and under a tolerably high power is seen to be finely punctate.

As regards colouration, the palaeozoic *Lingulae* are, as a rule, devoid of colour, an exception being *L. symondsi*, as remarked by Davidson.¹

The shell-structure of *Lingula* has been known through the work of Dr. W. B. Carpenter and M. P. Gratiolet. There are certain points in the descriptions by these two authors which are somewhat difficult to reconcile, and some further notes which I hope to publish later upon the structure of the recent and fossil examples may help to clear away these obscurities. It is sufficient to point out here that, whilst Carpenter² refers to the *Lingula* shells as being “almost entirely composed of laminae of horny matter, which are perforated by minute tubuli, closely resembling those of ivory in size and arrangement, and passing obliquely through the laminae,” Gratiolet³ has described the shell-structure in the living species—*L. anatina*, Lam.—as composed of several alternating layers of horny and calcareous

1 Mon. Brit. Sil. Brach. (Pal. Soc.), 1866 (1867), p. 34. “. . . none of the many fossil species hitherto collected throughout the entire sequence of sedimentary deposits, from the *Lingula* Flags upwards, have shown the smallest vestige of colour; unless, perhaps, *L. symondsi* from the Wenlock Shale.”

2 Rep. Brit. Assoc. (1844), 1845, p. 18, pl. ix., fig. 22.

3 “Etudes anatomiques sur *Lingula anatina* (*L. anatina*, Lam.)” Journ. de Conchyl., vol. viii. (2nd ser., vol. iv.), p. 1860, p. 49.

material, the latter being vertically tubulated, and the horny layers devoid of any structure.

In the silurian shells here described the sections are of a pale brown colour. A transverse section shows finely laminated structure on the broken edges of the slice. Under a high power the corneous layer is seen to be crowded with minute vermiform canaliculi. They are rather smaller, and more irregular than those in Carpenter's figure (fig. 22, loc. supra cit.), and agree with his example not only in their being set obliquely to the plane of lamination, but also in tending to branch, so that in the same focal plane both the orifices and lengths of the canaliculi are seen (fig. 4).

A vertical section of the fossil shell was made which, although somewhat thick, owing to its brittleness, shows an alternate, laminate structure quite clearly. The shell is of the same relative weight as that of a living example, and agrees in the number of laminae, which vary in relative thickness according to the part of the shell from which the section was taken. The stoutest layers in the silurian shell measure about .05 mm. in thickness.

The darker layers in this silurian fossil appear to represent the calcareous laminae, and the lighter layers the corneous. The altered calcareous laminae, when closely examined, show a few distinct traces of vertical tubes, especially towards the limiting surfaces of the layer. The corneous laminae are distinguished by an obliquely striated or fibrillate structure, very finely canaliculated, as in a living *Lingula* shell (*L. albida*, Hinds), which I have examined in specimens kindly given by Mr. C. J. Gabriel; although these layers are stated by Gratiolet to be structureless in the living *L. anatina*. Some of the horny layers of the fossil shell have been invaded by a parasitic boring fungus, the thallus of which shows a tendency to spread in the plane between two sets of laminae, but also penetrates to some depth into the shell.

This silurian *Lingula* shows no trace of carbonate of lime, this mineral having probably been leached out during the long process of fossilisation; but so gradually has been the replacement by other constituents that the intermediate horny layers are left undisturbed. In the living *Lingula* shell the proportion

of carbonate of lime is very small, being 6.68 per cent., whilst the phosphate of lime is 42.29 per cent., and the organic matter 45.2 per cent.¹ It is therefore probable that the testaceous or calcareous layer is a phosphatised carbonate of lime, somewhat of the nature and composition of a crustacean carapace. My colleague, Mr. R. H. Walcott, F.G.S., has kindly tested this fossil shell, and obtained a decided reaction for phosphoric acid.

*Description and Details of the Parasitic Fungus Previously
Noted.*

Tubes of thallus .02 mm. in diameter, filled with dark ferruginous matter, occasionally branched, and sometimes bearing a globular sporangium. Thallus either as single wandering cells or densely matted (see Plate XLV., fig. 6).

The branching thallus penetrates the shell between the horny layers. It may be provisionally referred to as *Palaeachlya* cf. *tortuosa*, Etheridge fil., a parasitic form described by Mr. R. Etheridge, jr., from a Queensland carbopermian monticuliporid,² which has tortuous tubes with a diameter of .02 mm., and which exactly coincides with that of the present form. Another species, *P. torquis*, was described by the same author² from devonian corals (*Favosites*) of the Tamworth District, New South Wales; but this differs in having a more freely growing thallus, with slenderer tubes, of only half the diameter (.01 mm.).

Lingula cf. *striata*, J. de C. Sowerby. (Pl. XLV., Fig. 7).

(?) *Lingula striata*, J. de C. Sowerby, 1839, in Murchison's Silurian System, pt. II., p. 619, pl. VIII., fig. 12. *Lingula striata*, Sow., Murchison, 1859, Siluria, p. 543, pl. XX., fig. 7. Davidson, 1886, Mon. Brit. Sil. Brach. (Pal. Soc.), p. 45, pl. III., figs. 45-48. This is a nearly perfect brachial valve, occurring in the blue mudstone of South Yarra, which in its sub-oval form, with squarish anterior margin, and distant, regular growth-lines or

1 Gratiolet, op. cit., p. 62.

1 Rec. Geol. Surv. N.S. Wales, vol. ii. 1891, p. 95, pl. vii., fig. 1.

2 Rec. Austr. Mus., vol. iii., No. 5, 1899, p. 121, pl. xxiii., fig. 5.

concentric striae, resembles very closely the above species. *L. striata* is a Lower Ludlow and Wenlock species in Great Britain. The present specimen is only one-third the length of the measurements of the described example of Davidson's, but the original of Sowerby's Aymestry specimens comes nearer, with a length of 11 mm. The South Yarra specimen has a black, carbonised appearance.

Occurrence.—Silurian (melbournian). South Yarra (Yarra Improvement Works). Collected by Mr. F. P. Spry.

Lingula aff. *symondsi*, Davidson. (Pl. XLV., Figs. 8, 9).

Lingula symondsi, Davidson (Salter Ms.), 1866, Mon. Brit. Sil. Brach. (Pal. Soc.), p. 45, pl. III., figs 7-17.

The description of this species, given by Davidson, is as follows:—"Longitudinally oval or ovate, broadest about the middle, slightly tapering at the beaks, rounded in front; valves moderately and evenly convex, one valve a little more so than the other; surface smooth, marked only with fine concentric lines of growth. A large example measured—length 12, width 7 lines; but the shell is more often smaller."

The range of this species in Great Britain is from the Upper Llandovery to the Lower Ludlow. The specimen before us is a pedicle valve. It is roundly tapering towards the beak, rounded in front, moderately convex, and bears fine concentric lines of growth. Very faint radial striae can be observed under a lens in this Australian form, but since no other specimens are available it cannot be said whether the feature is distinctive. The fimbriate edges of the growth lines are probably due to weathering. In all other respects the shell is in close agreement with the British specimens. One British example of *L. symondsi* in the National Museum collection shows indications of radial striae on the worn surface of the valve.

Occurrence.—Silurian (probably passage beds between melbournian and yeringian). N.E. of Kilmore. Geol. Surv. of Victoria coll., locality Bb 24. The precise position is S.W. of Bald Hills, E. of Dry Creek and Kilmore. Collected by Norman Taylor, 10/11/57.

Lingula perovata, J. Hall. (Pl. XLV., Figs. 10, 11).

Lingula perovata. J. Hall, 1852, Pal., New York, vol. II., p. 55, pl. XX., figs. 3a, b.

The original description runs as follows:—

“Shell abruptly obovate, as wide as long, the base regularly rounded, and the sides much expanded; beak abruptly acute; surface marked by fine, rather distinct, elevated concentric lines; intermediate spaces smooth to the naked eye, but exhibiting under the magnifier fine, scarcely elevated, concentric lines.”

The present example is a pedicle valve, from the yeringian sandy mudstone of Merriang Road, near Whittlesea.¹ It is somewhat damaged on the median area, but shows the outline clearly, and part of the ornament, consisting of distinct, distant ridge-like striae, not crossed by radial lines. The interspaces between the concentric striae are marked by fine concentric lines exactly as in the North American specimens. Prof. J. Hall's examples came from the Upper Green Shale of the Rochester stage, which forms part of the Niagara series (Wenlockian).

The only other species which closely approaches this form in its regularly subtriangular shape is *L. roualti*, Salter,² from the Budleigh Salterton Pebble-beds (? ordovician). However, the radial striae serve to distinguish it from the present example.

Hall and Clarke, in their monograph on the Palaeozoic Brachiopoda,³ draw attention to the fact that the acuminate type of *Lingula* prevailed both numerically and specifically in the earlier faunas and persisted until carboniferous times. It is not represented in the living species of the genus.

Measurements.—Length, 4.75 mm.; width, 5.25 mm.

Occurrence.—Silurian (yeringian). Merriang Road, section 3, near Whittlesea. Found and presented by Mr. J. T. Jutson.

¹ Recorded as (?) *Lingula* by the writer in J. T. Jutson's "The Silurian Rocks of the Whittlesea District." Proc. Roy. Soc. Victoria, vol. xxi., Pt. I., n.s. (1908), p. 221.

² Quart. Journ. Geol. Soc., vol. xx., 1863, pl. xvii., figs. 4, 5. Also Davidson, Mon. Bil. Brach. (Pal. Soc.), 1866, p. 40, pl. I., figs. 14-20. Idem, Quart. Journ. Geol. Soc., vol. xxvi 1870, p. 76, pl. iv., fig. 2.

³ Geol. Surv., State of N. York. Palaeontology, vol. viii., pt. i. 1892, p. 5.

EXPLANATION OF PLATE XLV.

- Fig. 1.—*Lingula lewisii*, Sow., var. *flemingtonensis*, var. nov. Silurian (melbournian). Moonee Ponds Creek, Flemington. Geol. Surv. Coll. Nat. size.
- Fig. 2.—*L. lewisii*, Sow., var. *flemingtonensis*, var. nov. Portion of shell of another specimen, showing the deep radial striae; also the irregular character of the concentric growth lines. Silurian (melbournian). Moonee Ponds Creek, Flemington. Geol. Surv. Coll. $\times 3$.
- Fig. 3.—Ditto. Vertical section of the shell (external surface beneath), showing the pale horny layers, the dark, altered intermediate layers, and also traces of a parasitic boring plant. Same locality. $\times 52$.
- Fig. 4.—Ditto. Thin flake of shell parallel and close to surface, showing minute canaliculi permeating the horny shell substance. (Diagrammatic). Same locality. $\times 380$.
- Fig. 5.—Ditto. Portion of vertical section of shell shown in figure 3, more highly magnified, with fibrous horny layer below (*a*), surmounted by the original calcareous layer (*b*). $\times 100$.
- Fig. 6.—Ditto. A flake from the horny layer of shell, probably near visceral surface, perforated by boring fungus. Same locality. $\times 60$.
- Fig. 7.—*Lingula* cf. *striata*, Sowerby. Silurian (melbournian). South Yarra. Coll. F. P. Spry. $\times 2$.
- Fig. 8.—*L.* aff. *symondsi*, Sow. Silurian. N.E. of Kilmore. Coll. Norman Taylor. $\times 2$.
- Fig. 9.—Ditto. More highly magnified surface of same shell, showing the fimbriated concentric growth lines, and faint radial striae. $\times 6$.
- Fig. 10.—*L. perovata*, J. Hall. Silurian (yeringian). Merriang Road, near Whittlesea. Coll. J. T. Jutson. $\times 2$.
- Fig. 11.—Ditto. Portion of shell surface more highly magnified, showing ridge-like growth lines and intermediate striae. $\times 6$.